

TITLE OF INVENTION: "A massive construction system using rock masonry."

CROSS-REFERENCE TO RELATED APPLICATIONS      Not applicable.

STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH      Not applicable.

REFERENCE TO A SEQUENCE LISTING, A TABLE OR A COMPUTER PROGRAM  
LISTING COMPACT DISC APPENDIX      Not applicable.

## BACKGROUND OF THE INVENTION

### Field of Invention

This patent application falls in the "Construction System's" field. It is a method to produce massively dwellings or any buildings at an affordable cost from preliminary planning to all other construction steps: foundation, walls, roofing, finishing, cleaning and delivering. The System is using several prior arts, which are improved and combined together to accomplish a method capable to produce high volumes of dwellings at an affordable cost, and in a short lapse, and without employing expertise labor.

### Description of Prior Art

#### (a) Masonry wall construction

Masonry wall construction is a very old building practice; in the Greek island of Thera (known as Santorini) the mortar used was the local volcanic soil. This practice was successful but slow.

In the Imperial Rome, the inventive mind of the Romans and the availability of volcanic sand with cementing properties, crafted a mortar to cast masonry with natural stone, or rubble from demolition; the Pantheon in Rome, built circa 123 A.D., is one among many still standing in our era. Although Romans accomplished such long standing constructions using a system of "lost molds" (two parallel brick walls for casting masonry,) had to withstand a time-consuming production since these brick molds were incapable to hold the lateral forces of all the liquid mortar necessary to fill said lost molds to the expected height in one pour, as a result was done in rows after rows. Furthermore, this system was possible because slavery was legal in Roman times, so a titanic inexpensive labor crew was feasible for handling too heavy duties.

(b) Conventional masonry construction, currently used.

This system calls for several construction materials, such as stone masonry, concrete blocks, clay bricks, and the like to build walls. The construction must be coordinated with the footing construction, and a qualified labor as well as supervision to perform several demanding tasks.

Besides, after walls have been built, electrical, plumbing pipes, and outlets are installed, consequently said walls are later on scoured and patched. Furthermore, headers for door and window openings, and door and window frames must be put, having one make use of more construction supplies that in time get cracks in between, so their exterior perimeter have got to be caulked and maintained.

In addition, delivery of materials and their reception with all the clerical work involved has to be handled, making the whole process time consuming and highly costly.

(c) Wood or metallic framing walls.

The framing construction requires qualified labor and close supervision of anchors, especially for certain sections of walls capable of resisting earthquakes.

Connecting metallic members with nails or setting directions is difficult, that on occasions workers who do not understand instructions skip them and supervisors do not notice that omission, and as a consequence the desired quality of the structure is not quite accomplished.

Although metallic framing is better than wood framing regarding termites and flammability, requires more specialized labor and tight supervision making the system expensive.

Further, to make walls from both framing systems it is needful to plaster exterior or apply a siding material on perimeters, and for an interior face and partition walls gypsum board is normally used. Thereafter a furring process which requires specialized labor, plus shear reinforcement and installation of windows and doors with all the complications of caulking, flashing and leveling. Whilst, if insulation is required, rigid insulation is expensive to use and blanket insulation requires wider depth for higher values, condition which asks for an increase in the width of the walls, as the items used called studs need to be wider, or use a double framing and a rise in costs.

Finally, delivery and reception of materials need lots of clerical work, causing time consuming and all the process is highly costly.

(d) Prefabrication System.

Prefabrication involves lots of materials: steel, aluminum, wood, panels of combined materials including plastics, and even concrete, mainly light weight concrete. Moreover to assemble a building using prefabricated elements encompass several conditions because of being produced by industrial means, increasing costs and making such system more fancy than effective.

It also requires a factory, specialized machinery, technical personnel, and a market absorbing the planned production, and enough storage space for the elements in stock, as delivery of materials and reception with all clerical work involved.

All the process is time-consuming and complex, since fabrication limits the amount of units to be built as availability of elements is the function of the factory's production. This system cannot solve a high demand of dwellings for a disaster solution.

As a final inconvenient point, design solutions depend on the modular dimensions hence, limiting innovation, flexibility, and functionality.

## BRIEF SUMMARY OF THE INVENTION

The present invention is aimed at producing massive amounts of dwellings and the like, sorting the positive advantages of reliable prior arts, and coordinating, and translating them to our present times to produce strong, monolithic enclosures at an affordable cost, which overcomes the foregoing drawbacks of the conventional arts after a combination and improvement of them.

It is an object of the present invention to provide a method, based on concrete masonry and precast concrete accessories, a construction lapse compressed in five days for one building unit, as follows:

- On the first day shall be built the waste lines, foundation, and floor slab.
- On the second day, by means of specially designed molds and precast items: walls shall be cast; windows and doors shall be installed to finally have a monolithic unit.
- On the third day a reinforced concrete slab shall be put in place, whilst concrete additives shall be used to remove the formwork safely the following day.
- On the forth and fifth days shall be installed bath and kitchen fixtures, and finishing details shall be performed, such as: floors, roofing, and painting.
- After cleaning, at the end of the fifth day, one story dwelling shall be delivered.
- A multistoried building takes additional time.

The set of molds of each phase: foundation, walls, and roof shall be moved to the next site every day; thus, shall be produced a finished building every day from the fifth day of starting the

construction. The number of units delivered a day shall depend on the number of sets of molds to be used.

#### Advantages of the Present Invention

The use of the present invention not only will provide housing and related buildings to a world wide exploding population at a fair cost.

The present invention starts the construction process by obtaining information of the working conditions and requirements, in order to do a specific design and plan of action. Consequently, an open forum of discussion for the design solutions regarding budget and time frame, evaluating resources and geographical limitations for example weather and seismic conditions. Traditional and social constraints will also be considered. All this intellectual and technical implementation in comparison with other construction systems, which only follow traditions without making the players part of the solution, provide a further education for the personnel involved in the use of the present invention.

Another object of the present invention is to provide the necessary training to the work force in order to use efficiently the system, creating a new working expertise and education skills which can improve the social environment of the workers, and related personnel to the construction process.

Another object of the present invention is to provide special precast items such as headers, and sills to complement windows and doors openings. These precast items lower costs and increases speed with high results in the construction process.

Another object of the present invention is to design a set of wall wood molds, using traditional techniques, but with improvements which when utilizing every day can be used 30/40 times.

Another advantage of the present invention is to provide a low cost in maintenance because concrete masonry is waterproof, for this reason, no oxidation risks arise providing a long lasting performance. What's more, no termite attacks; and no use of construction materials as lumber, thus, natural resources undermining is avoided.

Another advantage of the present invention is to provide the possibility to build walls with all the ginger bread, when desired by the user, and no additional specialized labor or cost. Since one of concrete's attributes is that it molds into any shape of any special mold, creating a final structure that has the shape, line and volume of any dimension one may require.

Another advantage of the present invention is to provide no limitation of shape, size, or functionality; as walls can be of any desired thickness, appearance, and functionality; and alcoves to contain insulation materials can be added, etc.

Another advantage of the present invention is to provide a strong and light roof structure of reinforced concrete, type known as T-beams, which uses a small volume of concrete to cover a comparable long span.

Another advantage of the present invention is to provide a cost reduction in improving the thermo function of the roof, by using either insulation or alternate material to form the T-beams' stem.

Another advantage of the present invention is to provide a place to embed electrical, plumbing or other pipes protecting these main elements from damage as a consequence of using reinforcement for the concrete.

Another advantage of the present invention is to provide an earthquake, fire; termite, hurricane, and flooding proof construction due to concrete masonry's characteristics, and the monolithic nature of the structure.

All the foregoing advantages distinguish the present invention as a powerful construction system of dwellings and the like, in improving and combining prior art, besides, introducing some new items and concepts. Giving the building industry worldwide the opportunity to satisfy the need of affordable constructions at massive production levels.

Furthermore, another important advantage of the present invention is that it has no limited scope regarding building type; as it is fitting for the construction of dwellings, schools, commercial buildings, offices, and medical services, hotels, etc., one level or multiple stories, and can be simple or trendy according to the ability of who designs the particular architectural style. The use of the present invention will improve the construction industry worldwide, creating jobs and increasing business in massive numbers.

#### BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

The foregoing Summary as well as the following Detailed Description of Preferred Embodiments is better understood when read in conjunction with the appended drawings. For the purpose of illustrating the invention, there is shown in the drawings embodiments which are presently preferred. It should be understood, however, that the invention is not limited to the specific methods and instrumentalities disclosed.

FIG. 1 is an exploded isometric view of the preferred embodiments of the present invention.

FIG. 2 is isometric sketches of precast items, and anchor structure.

FIG. 3 is a series of sketches of the operations to produce the footings and floor slab in the first construction day.

FIG. 4 is a series of sketches of a construction sequence to set the wall molds.

- FIG. 5 is a series of sketches of a construction sequence to install windows using the precast sill and header before pouring concrete masonry for walls.
- FIG. 6 is a series of sketches of a construction sequence to install doors: exterior or interior using the precast header before pouring concrete masonry for walls.
- FIG. 7 is a series of sketches of a construction sequence to pour the masonry concrete into the walls in the second day of construction.
- FIG. 8 is a series of sketches of a construction sequence in building a T-beam roof, and rigid insulation or hollow concrete blocks are used to mold the stems.
- FIG. 9 is a bar graphic describing times and actions to accomplish the construction of a dwelling unit in five days

No more drawings are necessary, because the following fourth and fifth day of construction are used to install bath and kitchen fixtures, glazing, painting, flooring, roof waterproofing and details. This part of the construction uses conventional systems.

## DETAILED DESCRIPTION OF THE INVENTION

To facilitate the understanding of the drawings and/or written descriptions, a key number is listed below:

### 1. Foundation-

This includes: footings with a shape, where the base is big enough to distribute the imposed loads of walls and roofs to the ground. A floor slab shall be of concrete 18 for floor finishes. An anchor structure 6 a device half embedded where concrete masonry walls shall be set, of the present invention, to connect said footings with the walls.



2. Concrete masonry walls-

Walls are elements to enclose spaces from the weather, noise, etc. plus providing privacy. Walls definition includes openings: doors and windows. In the present invention solid walls are built with a concrete masonry 17+18, and the openings use precast headers 4 and precast sills 5, whilst windows frames, and doors frames, and leafs can be of any material, brand or manufactured in construction site. The present invention denotes the molds modifications to make use of the foregoing.

At the top of walls shall be embedded anchor structure 6 anchoring thereof as footing, because the structure holds beams of roof with walls creating a monolithic structure, a feature of the present invention.

3. Roof (proposed in the present invention)-

It is of concrete referred to as T-beams 37 as it consists of beams with a T-shape, having a long stem with a narrow base at the vertical part of the T. This stem shall be reinforced with a steel structure 26 where the rod elements resist flexion stress in the lower part of the structure, held together with stirrups (bent rods, usually in a U-shape or a W-shape), and also holds metal mesh 27.

Said metal mesh 27 is an arrangement of steel bars or wires normally in two directions at right angles, tied or welded at intersections; a reinforcement of the horizontal bar of said T-beam 37.

Said T-beams shall be set at equal distances one from the other, condition which defines T-beam system. To assure the equal distances, and build easily the stem, and give roof insulation (additional quality) the present invention uses rigid insulation panels 24 for extreme weather conditions, or hollow concrete block 25 for less critical conditions.

For buildings without snow endurance one quarter per inch per one foot slope shall be used, by thickening the slab were necessary. On the other hand, for snow conditions roof beams can be built at any pitch required.

4. Precast header-

This is an accessory element to enclose the top of openings where doors 29 or windows 28 shall be located. It is build with reinforced concrete 18 and a structure of rebars and stirrups 34 and molds that shall rest on the ground and be cured 38 for 7 days without moving them to reach complete resistance, as required.

5. Precast sill-

This is another accessory element to enclose bottom of openings where windows **28** shall be located. It is build with reinforced concrete **18** and a structure of rebars and stirrups **34** and molds shall rest on the ground and be cured **38** for 7 days without moving them to reach complete resistance, as required.

6. Anchor structure-

Used in between footings and wall, and between walls and roof. This is a structure of rebars and stirrups, with a width of two inches less than the width of the wall, covering one inch at each side forming part of wall **2** at the bottom attaching walls to foundation footings, and at the top attaching walls **2** to roof **3**.

7. Perimeter foundation molds-

The molds for forming an exterior face of the foundation footings can be of wood, using wood stakes and wood bracing to set them vertically. Building them shall be under any conventional system, however, the dimensions shall be the ones described in the drawings because the idea is to have unskilled labor use them at least 40 times. Also, shall have a color code to locate them properly, hence, a red band in the front, blue in the right side, yellow in the left side, and green in the back side, plus black marks **32** with pointed arrows to show where ditches are going to be and width of them. All shall be clearly marked. This is part of the present invention to have an automatic construction.

8. Exterior wall mold-

The exterior molds shall be fabricated in the site using three quarters inch or thicker water resistant plywood panels of four by eight feet. Mold dimensions and/or panel material can be different if necessary. Drilled holes **36** are necessary to hold the molds at a parallel distance with ties **14** (said ties generate the thick of the wall.)

9. Wales-

To keep molds aligned. The exterior molds **8** and **13** shall be reinforced with wales **9**, a horizontal timber or beam, used to brace or support an upright member for formwork. This piece of lumber shall be two by four inches nominal by four feet long, nailed to plywood at the bottom of drilled holes **36** keeping the holes clear. Another row of wales 2x4 inches nominal by eight feet long shall be placed on top of said drilled holes **36** after ties **14** are in place, this 2x4x8 shall be placed in alternated positions in order to keep

plywood molds aligned when tightened with the wedges 15. Once wedges are tightened, bracing 10 shall be used to plumb the formwork properly.

10. Bracing-

Used in the present invention to plumb formwork. It is light formwork pieces of lumber 2x4 inches nominal by eight or ten feet long, sufficient to brace the formwork to an upright position. Some stakes shall be pounded into the ground to nail one end of the bracing, creating an angle to support upright the molds.

11. Plumbing pipes-

This refers to the main pipes which carry water and connect to secondary water pipes for feeding faucets installed in a building.

12. Electrical pipes-

These are the main pipes to contain wires connected to secondary pipes and boxes for distributing electrical power in a building.

13. Interior wall mold-

It refers to the opposite of mold 8 and has similar specifications to said 8. It shall have 36 holes as well and wales 9. No braces are necessary because once the ties 14 with the wedges 15 are tighten, the framework shall be plumb.

14. Ties-

They are separator wall items. They have several shapes and there are several brands in the market, the ones shown in the figures are only a sample of one of them.

15. Wedges-

They are used in conjunction with ties 14 to tight the molds to be filled with rocks 17 and concrete 18 as denoted in the present invention, as required. Wedges need to match with the chosen brand ties 14.

16. Scaffold-

The word which defines a temporary platform for supporting workers and materials on the face of one structure and to provide access to work areas above the ground, as shown in figure 7. It can be built under any safe conventional system with lumber or one of those in metal leased in the market till used.

17. Rocks-

In the present invention, it is the material used in high volume to produce said footings and walls 2. Rocks are 60 to 75 percent of the total volume. Rocks shall be the material of choice if they are abundant in the construction area, which means: no cost, to keep the final construction cost competitive. But, it is not a restrictive condition because the complement material, concrete 18, has the characteristic of being a material produced using engineering techniques to decide how much resistance shall be to compression stress. Making it possible to use any acceptable option of material to substitute said rocks, for example with rubble from fallen buildings due to natural disasters, war, or other causes, or tree trunks, or coconut shells, or chopped used tires, etc., to serve as a volume saver in the concrete masonry. The only condition shall be size; thus, the dimension shall allow the material go easily into the space in between molds.

18. Concrete-

Defined as a composite material consisting essentially of a binding medium within are embedded particles or fragments of aggregate. In the present invention shall be used Portland cement concrete, but it can be substituted by other types of concrete after studies prove it a suitable substitute. The mixture of sand, gravel, Portland cement, and water can be used under calculated proportions to have the wanted strength required; fiber glass also can be added to improve the characteristics of resisting tension of concrete. All the technical advances, plus its capability of taking the shape of the mold where is poured, makes concrete a very workable material.

19. Wood stick-

A rough tool, of a two by four inches lumber and eight feet long, one for wales 9, and others for workers to manually push rocks into concrete, while standing on the scaffold 16.

20. Trapezoidal-

A metallic accessory with a tubular shape designed to be embedded in concrete on top of walls, for holding with screws lumber or manufactured metallic connectors, used with beams as an alternate roof construction, instead of concrete T-beams. Also this tubular accessory can be embedded at the face of walls or under the T-beams stems to attach furring panels with screws for wall or ceiling finishing.

21. Graphic representation of an exterior wall built with concrete masonry, used in fig. 8.

22. Graphic representation of an interior wall built with concrete masonry, used in fig. 8.

23. A conventional structure of posts and beams-

Reinforced with diagonal lumber as braces, to support a platform for workers to handle materials on it, necessary to build a concrete slab

24. Rigid insulation-

This consists of boards of different materials available in the market to provide insulation to roofs **3** and exterior walls **2**. The present invention uses these boards for roof insulation and also, to mold the stems of T-beams **37**.

25. Concrete Masonry Units (CMU)-

Known as a block or brick cast of Portland cement used to lay up with other units as in normal stone masonry construction. In the present invention hollow Concrete Masonry Units are used as an alternate material to **24** to mold the stems of the T-beams roof, and also as an insulation material for non extreme climatic conditions. Laying CMU in a horizontal way, the hollows will be connected making the trapped air in them act as insulation.

26. T-beam reinforcement-

In the present invention, metal bars, rods, wires, or other slender members, previously designed by structural engineering calculations, are embedded in the concrete forming the stem, vertical part of the T-shape, in such a manner that the metal and the concrete act together in resisting the forces from loads of living traffic and/or wind, snow, and others imposed to the roof.

27. T-beam metal mesh reinforcement-

The horizontal shape of the T uses an arrangement of steel bars or wires, normally in two directions at right angles, tied or welded at intersections or interwoven. This mesh reinforcement is tied to the top rod of each of the T-beam reinforcements **26**, letting the mesh hang loose on the top of either one: **24** or **25** stem/insulation materials.

28. Window-

Any type of chosen window: wood or metallic, but provided with two anchors **35** at the back of its jambs to keep the window frame firmly attached to the concrete walls.

29. Exterior door and frame-

It shall be metallic wood or metallic, and shall have three anchors **35** at the back of both jambs to hold it to the concrete walls.

**30. Interior door and frame-**

It shall be wood or metallic, provided with anchors **35** at the back of its jambs to hold it to the concrete walls, the windows **28** and the doors **29**.

**31. Waste lines under concrete slab-**

Refer to an installation of pipes for trapping waste from toilet bowl, lavatories, kitchen sink, washing clothes machines or boards, and other fixtures. Used for cleaning purposes or disposal of feces and urine.

**32. Painted sloping strip marks in molds-**

To be guides to aid laborers. Different colors shall be used for different actions, for example, short parallel lines on the interior of the perimeter foundation molds **7** shall instruct workers where to dig a trench for a footing.

**33. Returns-**

These are nailed strips of lumber at a right angle to the interior face of wall molds **8** and **13** to hold in place door frames and precast items during concrete masonry pouring, in the present invention, for walls construction. They are made of a lumber of 2 inches thick by half of the jamb's dimension minus width of the wall. The length equals to the wall's height.

**34. Precast reinforcement-**

In the present invention it is metal bars, rods, wires, or other slender members, previously designed by structural engineering calculations, embedded in the concrete of the precast elements, in such a manner that the metal and the concrete operate together in resisting the forces from loads imposed on them.

The reinforcement shall consist of two rebars, one at one and a half inches from the top of the precast, and the other at one and a half inches from the bottom. These rebars form a structure with rod stirrups or hangers. The stirrups are usually made of rods of one quarter inch less in diameter than the rebars, and in U-shape bents; the bents are for holding said rebars, which are attached with an 18 gauge twisted wire. Said stirrups or hangers are at distances of no more than four inches center to center.

This reinforcement is a must for said precast items to resist shear and diagonal stresses, since it carries out the function of beams. Structural calculations (mathematical calculation based in formulas obtained by trial and experience to find the dimensions of the different elements used for forming a structure capable to resist the forces acting on them, this task falls in the field of the engineering) shall be necessary to verify diameter dimension of the rebars and rods; and concrete's compressive strength shall not be less than 5000 pounds per square inch, tested for twenty-eight days. There shall only be changes to the compressive strength if a structural calculation recommends it.

Said precast items shall be cured for at least seven days after concrete pour at a temperature above 50°F.

Wood molds in general shall be prepared using templates to make its production automatic.

#### 35. Metallic elements-

Those attached to windows **28** or doors **29** at the back of their jambs, shall provide anchorage to such windows or doors at the walls opening ends. The attachment of **34** can be by welding when **28** and **29** are of steel. Screwing **34** can be the attachment system for aluminum **28** and **29** or when wood or similar materials are used in its fabrication.

#### 36. Drilled holes-

Holes drilled to wall molds **8** and **13** shall be at the dimensions required to let ties **14** pass thru. The distance in between holes and number of holes per mold are per engineering calculations, considering the width and the height of the wall. Once the specifications are calculated one piece shall be drilled carefully, such piece shall be used as a template to drill all the ones used in the construction process.

#### 37. T-beams-

A reinforced concrete beam having a cross section resembling the letter T. This concrete roof system is very effective to save long spans with a short volume of concrete **18** in light reinforcement **26**. Extensively used in parking structures and factories construction but, its use in light constructions is not popular, as result of the cost involved by molds and labor in forming the stems of the T-shape. The present invention uses rigid insulation **24**, which is necessary for buildings in extreme climates or the hollow concrete

units 25 for non extreme climates. The use of 24 or 25 in the present invention overrides the cost of forming stems, making the T-beams used at a highly competitive cost. Besides, the engineering calculation techniques of the present invention let the support platform 23 be moved to the next location, the day after pouring onto roof, keeping the construction pace in schedule.

38. Curing-

Refers to keeping placed concrete humid during some definite time because concrete hardening is a chemical reaction that uses water to harden it properly and if there is not enough water during the chemical process the concrete cracks, making the item not what was expected.

39. Trowel finish-

A smooth-concrete-finished surface produced by a flat tool.

To use the present invention the process starts with the listing of the program's requirements regarding:

- General concept

The present invention massive CONSTRUCTION SYSTEM at an affordable cost based on the use of concrete masonry and unskilled labor to produce dwellings and the like.

- Basic Construction System, is illustrated by the figure 1, which shows an exploded sketch of three basic elements:
  - Foundation.
  - Walls.
  - Roof.

Foundation 1,



The present invention shall use concrete masonry 17+18, and the proposed molds 7 specially designed to produce one foundation unit per day. Said molds shall be used in an automatic manner thanks to a color code 32 (a detailed sequence of steps to build foundation and related elements marked on said molds) refer to figure 3.

#### **Walls 2,**

The present invention shall built a solid continuous surface using concrete masonry 17+18, (see figures 4 and 7 for detailed information of placing molds and pouring concrete masonry) according to the geographical location by adjusting its shape and process in building, as availability of construction materials, climate variations, seismic forces, flooding, etc. shall be considered. Penetrations of doors and windows are discussed in detail figures 5 and 6.

Also the Construction System in the present invention can be customized to a certain economical circumstances such as a limited budget, and a social and/or ethnical architectural style, and to a critical condition which is the availability of the construction materials and labor.

Regarding the foregoing the present invention as a Construction Method shall not be limited to the physical characteristics shown in the attached drawings, but shall use technical knowledge in general to solve any special circumstances to provide a solution in building swiftly and at an affordable cost to satisfy the needs in whatever construction site.

#### **Roof 3,**

Construction in the present invention shall be with concrete 18 T-beams 37, a shape that can be obtained using rigid insulation 24 when required; or hollow concrete blocks 25 for places with mild weather; or factory produced fiber glass molds to create a coffered shape.

An alternate roof construction of lumber, wood trusses, thatched on three branches, etc. can be used, with a simple change in the anchoring connection used for holding roof structure on top of the concrete masonry walls.

For a better understanding of the process it shall be divided into five sections:

1. “Preliminary Work”
2. “Foundation”
3. “Walls”
4. “Roof”
5. “Finishing”

- 1.- Preliminary Work –

As follows:

At first shall be carried out discussions about the Construction Method with the personnel in charge of the construction to set conferences for training labor, because it is important the labor personnel understand how their work shall contribute to the success of the aim, and to clarify the construction techniques contained in the present invention because they are different in approaches and goals from conventional ones. Also, to enhance the idea that the present invention approaches massive construction in a short time, and the goal is to build affordable dwellings or any building. Locating and designating an area to produce all precast or preassembled items needed for the invention shall be done, to have the present invention running swiftly.

(See Fig. 2) Precast items: headers **4** and sills **5** shall all be made of reinforced **34** and concrete **18**, in the designated area referred above.

(See Figs. 4) In the preliminary task for wall molds, exterior **8** and interior **13**, holes **36** shall be drilled into panels of plywood, normally of four by eight feet, and then shall be nailed three 2x4 wales **9** to reinforce **8**. Different location of holes **36** and dimensions of the plywood, as well as dimensions and number of said wale **9** shall depend on the walls' width, height, location, and/or special constraints, or uses of the building to be built.

- 2. - Foundation –

Actual construction starts with the foundation for one unit. See figs 3, as follows:

- (Fig. 3A) Grading levels. A similar shape and form of the ground under and surrounding the constructions shall be required to let rainwater ran freely without going inside the building.
- (Fig. 3B) Waste lines 31 under concrete slab. An excavation shall be required to have trenches for installing pipes that trap waste for cleaning purposes or disposal of feces and urine.
- (Fig. 3C) Said waste lines 31 set in place. Said pipes shall be installed on the slope to connect end of the line to a main waste line or septic tanks, depending on the infrastructure available at the construction site.
- (Fig. 3D) Placement of exterior perimeter molds 7. By following the instructions discussed in the conferences of Preliminary Work and considering the location of buildings in drawings. Said exterior perimeter molds 7 for first building shall be set by a trained supervisor, using dimensioning and leveling tools, and the next ones shall use the first one as datum for a swift placement of the molds 7. This and other tasks are the items for discussion and understanding in the said Preliminary Work.
- (Fig. 3E) It shall be dug trenches following the perimeter molds 7.
- (Fig. 3F) It shall be dug trenches for interior footings following painted marks 32 located on said molds. The depth of the trenching shall be enough to retire contaminated soil, whilst earth from the excavation shall be deposited in between trenches.
- (Fig. 3G) Trenches shall be filled with one layer of big rocks 17 to give room for the next task.
- (Fig. 3H) Concrete 18 shall be poured on said rocks17 using concrete vibrators to make said concrete move in between said rocks, filling voids.
- (Fig. 3I) Operations (g) and (h) shall be repeated until reaching eight inches (20 centimeters) plus o minus below the top of the perimeter of said molds.
- (Fig. 3J) A layer of rocks 17 shall be placed on the area in between footings, these rocks can be of any dimension as long as when laid down form a flat bed and after a concrete mat is poured forms a slab floor of around four inches high, a horizontal finish floor level.

This layer works as a cushion in case of an expansive soil condition. Expansive soil, has the characteristic of reducing greatly its volume when dry, but comes back bigger with moisture. This condition breaks the concrete slab floor very easily. In the General art metal mesh is used, similar to 27; but in the present invention shall be used rock beds, which guarantee space for soil volume changes and works better than a conventional metal mesh.

(Fig. 3K) A structure of rebars and stirrups 6 shall be half embedded on said perimeter molds 7 when the concrete is still soft, leaving open spaces for doors and sills, as marked by the color code 32.

(Fig. 3L) Lastly, the floor surface shall be smooth with a metal hand tool named trowel 39. Then, cured 38 with clean water after the floor slab is hard enough to traffic without showing marks. A water hose can be used.

- 3. – Walls.

Construction of walls, see figs. 4, as follows:

(Fig. 4A) One side of wood molds 8 shall be erected, this mold is the one reinforced with three wales 9 of a 2x4 (5x10 cms. nominal) wood and nailed, to keep molds aligned, and shoring elements 10 shall be used to brace and to straighten them into a perfect vertical position.

Plumbing pipes 11 and electrical lines 12 and others shall be set inside of the embedded structures of rebars and stirrups 6. The structures 6 have a double function, one being a structural connection in between foundation and walls, and another a protector of piping lines from rock hits which may happen when throwing rocks 17 during concrete 18 masonry pour if no protection is considered.

(Fig. 4B) Once the wall molds are in place ties 14 separators for assembling wall molds, shall be inserted into the pre-drilled holes 36 of the molds 8.

(Fig. 4C) Then, ties 14 shall be inserted into the pre-drilled holes 36 of molds 13.

(Fig. 4D) Wedges 15 shall be used at the two ends of ties 14 to tighten together said molds 8 and 13. At this point said molds for solid walls shall be ready for concrete masonry pouring. This operation of pouring walls with concrete masonry is shown in Fig. 7.

For window placement see Fig. 5.

(Fig. 5A) It is an exploded sketch showing precast sill 5 that shall be set against and in between nailed wood return pieces 33 of molds 8. The window 28 shall be placed on top of sill 5.

(Fig. 5B) It is an exploded sketch showing said precast sill 5 against and in between said nailed wood return pieces 33 of said molds 8. Said window 28 shall be placed on top of said sill 5.

(Fig. 5C) It is an exploded sketch showing said precast sill 5 against and in between said nailed wood return pieces 33 of said molds 8. Said window 28 is now on top of said sill 5. The two molds 13 are shown in an exploded position. Note that all wall molds do not show holes 36 or wales 9 or braces 10 but all these elements shall be present and used as before stated in figs. 4.

(Fig. 5D) It is an exploded sketch showing said sill 5 against and in between the 33 of the 8. The 28 is on top of said 5, said two molds 13 as shown in place, too, however, all wall molds shown do not show said holes 36, said wales 9, either said braces 10, ties 14 and wedges 15, which shall be used to tight said 5, and said 28. Precast header 4 shall be set on top of said 28 and in between said 33 attached to wall said 8 and the 13 as shown in an exploded sketch. Note that said 33 have the double function of holding precast items and window or door frames, and they are a stop forming the ends for the concrete masonry in between openings.

Door placement, see figs. 6, as follows:

- (Fig. 6A) It is an exploded sketch showing door **29** or **30**, an exterior or interior door, which are similar, that shall be set against and in between nailed wood return pieces **33** of molds **8**.
- (Fig. 6B) It is an exploded sketch showing said door **29** or **30**, against and in between nailed said wood return pieces **33** of said molds **8**.
- (Fig. 6C) It is an exploded sketch showing the **29** or **30**, against and in between the **33** of the **8**. Molds **13** are shown in an exploded position, too. Note that all the wall molds shown do not show holes **36**, wales **9**, either braces **10**, however all these elements shall be present and used.
- (Fig. 6D) It is an exploded sketch showing said **29** or **30**, against and in between said **33** of said **8**. Said **13** are shown in position holding said **29** or **30**. Note, once more all said wall molds do not show the **36**, the **9**, either the **10**, ties **14** and wedges **15**, which shall be used to tight said **29** or **30**. The precast header **4** is shown in an exploded sketch; it shall be on top of said **29** or **30** and in between said **33** attached to said **8** and **13**. Said **33** have a double function: hold the precast items and said **29** or **30**, whilst they also are a stop forming the ends for the concrete masonry in between openings.

Pouring concrete masonry into molds of walls, see figs. 7, as follows:

- (Fig. 7A) After bracing and verifying the plumb of the molds scaffold **16** shall be set and rocks **17** shall be put on the scaffolds to do the pouring.
- (Fig. 7B) Concrete masonry cast into said molds shall start by filling said forms **8** and **13** to two feet eight plus or minus of concrete **18** (a mixture of cement, gravel, sand, and water at appropriate proportions to have a 5000 pounds per square inch), a resistive quality.
- (Fig. 7C) Once said two feet eight of concrete **18** are inside the molds, said rocks **17**, which must be one dimension smaller than the distance in between said forms, shall be pushed using a 2x4 stick **19** into the soft concrete, one after another, until no said concrete is covering the top of said rocks. Then a second layer of concrete shall be placed on top, and another layer of rocks pushed once more into said soft concrete.

The filling does not need to be in all said forms at the same time, the pouring can be advancing, thus a layer of 10 feet in length shall be poured into a form end and said layer is not even in width but instead of an approximate 45 degrees slope, to have rocks pushed into; and after that another layer of 10 feet in length shall be poured besides the first to have rocks also pushed into, and over again, till the bottom of the forms is covered with one layer of concrete masonry and ready for the next. This helps to avoid concrete hardening and the next masonry placing shall have a strong bonding.

(Fig. 7D) After filling said forms to the top, and before said concrete starts hardening, structures of rebar and stirrups **6** shall be half embedded at the top of the walls.

(Fig. 7E) An alternate option, in case lumber or metal roof structures shall be required, a screw item **20** shall be embedded instead at the top of said walls.

Once completed the foregoing operations, the work for the day is done, said concrete shall be dry in the following day and said molds shall separate from said concrete because of a chemical reaction, a loss in water reduces its volume, liberating itself from said forms. Therefore said forms shall be easy to move onto the next wall forming.

- 4. – Roof.

Construction of roofs, see figs. 8, as follows:

(Fig. 8A) This sketch shows a section of two exterior walls **21** connected to a footing with a structure **6**. Another structure **6** is half embedded as shown on top of said walls **21** that shall anchor concrete T-beam **37**. Also, the sketch shows one interior wall **22** in between said exterior walls with a structure **6** half embedded on top to anchor the concrete and form a solid connection with T-beam **37** (shown in sketch 8E.)

(Fig. 8B) This sketch shows the same section of 8A , plus a conventional structure of posts, beams and a platform of panels, all under number **23** (wood forms for supporting a construction of concrete slabs), in an schematic representation where bracing and base supporting posts are omitted for clarity.

- (Fig. 8C) This sketch shows the same section of 8B, with said conventional wood forms **23** for supporting concrete slabs. The surface of platform **23** has on top rigid insulation panels **24**. The panels form a stem of said T-beams **37** (shown in sketch 8E) and also provide temperature insulation to the roof.
- (Fig. 8D) This sketch shows the same section of 8B, with said conventional wood forms **23** for supporting concrete slabs. The surface of platform **23** has on top an alternate option, hollow concrete blocks **25**. This option can form the stem of said T-beams **37** (shown in sketch 8E) and also provide temperature insulation to the roof instead of said panels **24**.
- (Fig. 8E) This sketch shows a blow up section of the supporting platform **23**, and the stem forming/insulation, which can either be **24** or **25** as above mentioned in (8C) and (8D). In addition, shows a metallic mesh **27** used for reinforcing the slab that is part of said T-beams **37**. Said slab shall also be used to install plumbing and/or electrical piping, embedded into concrete **18** of said T-beams **37**. The triangular shape embodies steel reinforcement structures **26**. The broken line represents the top of said concrete **18** that shall be poured in the next operation, when all the foregoing elements are in place. The ellipse marks one T-bar **37** as one unit, which connects with the others to form all roof **3**.
- (Fig. 8F) This sketch shows the roof **3** after top of surface was smoothen with a trowel finish **39**. The sketch also shows a hose pouring water for curing **38** after said trowel finish **39** and when said concrete **18** is still soft but supports traffic.
- Said curing **38** shall be done at least 3 times a day for the next two days. In hot climates shall require more curing as slab dries faster, as said curing **38** shall be provided every time the slab is almost dry.

The day after, **23** shall be moved to the next construction site to keep up with the work schedule. This is possible because the concrete shall be mixed with chemical additives to accelerate the hardening chemical reaction (there are several brands of additives in the market). Furthermore, instead of concrete **18** a fast set Portland cement can be used if available at the construction site. Engineering calculations for laying down the proportions of Portland cement, sand, gravel, water and chemical additives shall consider moving a supporting platform the day after concrete pour.



Also, in the present invention shall require the reinforcement 27 with bolder re-bars than the ones necessary when supporting a platform for seven days, as in the conventional systems, however, using them for one day in the present invention reduces cost.

- 5. – Finishing.

The subsequent operations of painting, installation of bathroom and kitchen fixtures, glazing, details and others, are performed under any methods being used in the area of the construction site, therefore, no mention is necessary. However, it is worth mentioning that female labor shall be used for these tasks because they are better in details and thus, more effective in finishing tasks and it can improve the economy by giving job opportunity to women.

From the foregoing description, it can be seen that the present invention comprises an easy and swift construction system of buildings. It will be appreciated by those skilled at the art that this is for covering any architectural structure under any specification of use or architecture style. Although, the foregoing illustrated the basic material for masonry construction as rocks, it can be substituted by another material available in site, for example coconut shells, rubble from former buildings destroyed by wars or natural causes as earthquakes, or others, even old rubber tires. The function of the basic material is to reduce the volume of concrete used. However, the advantage of concrete is that it can be controlled, as the resistive stress can be customized by calculations of proportions of its components: sand, gravel, cement and water.

It is understood, therefore, that this invention is not limited to the particular construction material and shapes disclosed, but is intended to use the material of construction in site, and any specification or style of construction defined by the appended claims.

It shows a work schedule in a simple tabular form of a process to build 40 units with a set of forms. Serving as the base to figure out how many sets are necessary to build the desired number of units in an expected time frame for a specific job.